

United States Patent

[11] 3,589,100

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[21]	Appl. No.	812,987
[22]	Filed	Apr. 3, 1969
[45]	Patented	June 29, 1971
[73]	Assignee	Halm Instrument Co., Inc. Glen Head, N.Y.

3,377,772	4/1968	Lyon et al.....	53/229
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[54] DOUBLE WEB PACKAGING MACHINE
7 Claims, 30 Drawing Figs.

[52] U.S. Cl. 53/124,
53/229

[51] Int. Cl. B65b11/12, 53/229

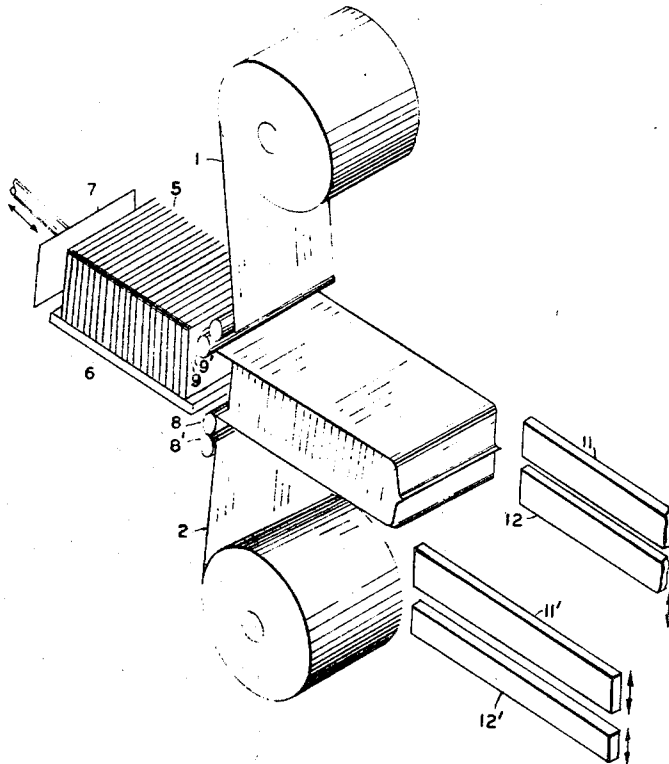
[50] **Field of Search**..... B65b 63/02
53/182,
198, 229, 124

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ABSTRACT: The invention is a machine for wrapping bundles of variable size and width such as bundles of envelopes or mail. Upper and lower webs of heat-sealable material are fed to a first location and sealed together. The bundle is pushed against the sealed webs and the webs are then end-sealed at the rear of the bundle. The end-sealed bundle is then moved to a second location on a collapsible table and the sides of the webs are sealed. One of the side-sealing means is movable so as to accommodate variable width bundles. Excess wrapping material is then cut off one or both the sides and the bundle ejected. This invention relates to means for wrapping bundles of mail of variable size in heat-sealable plastic.



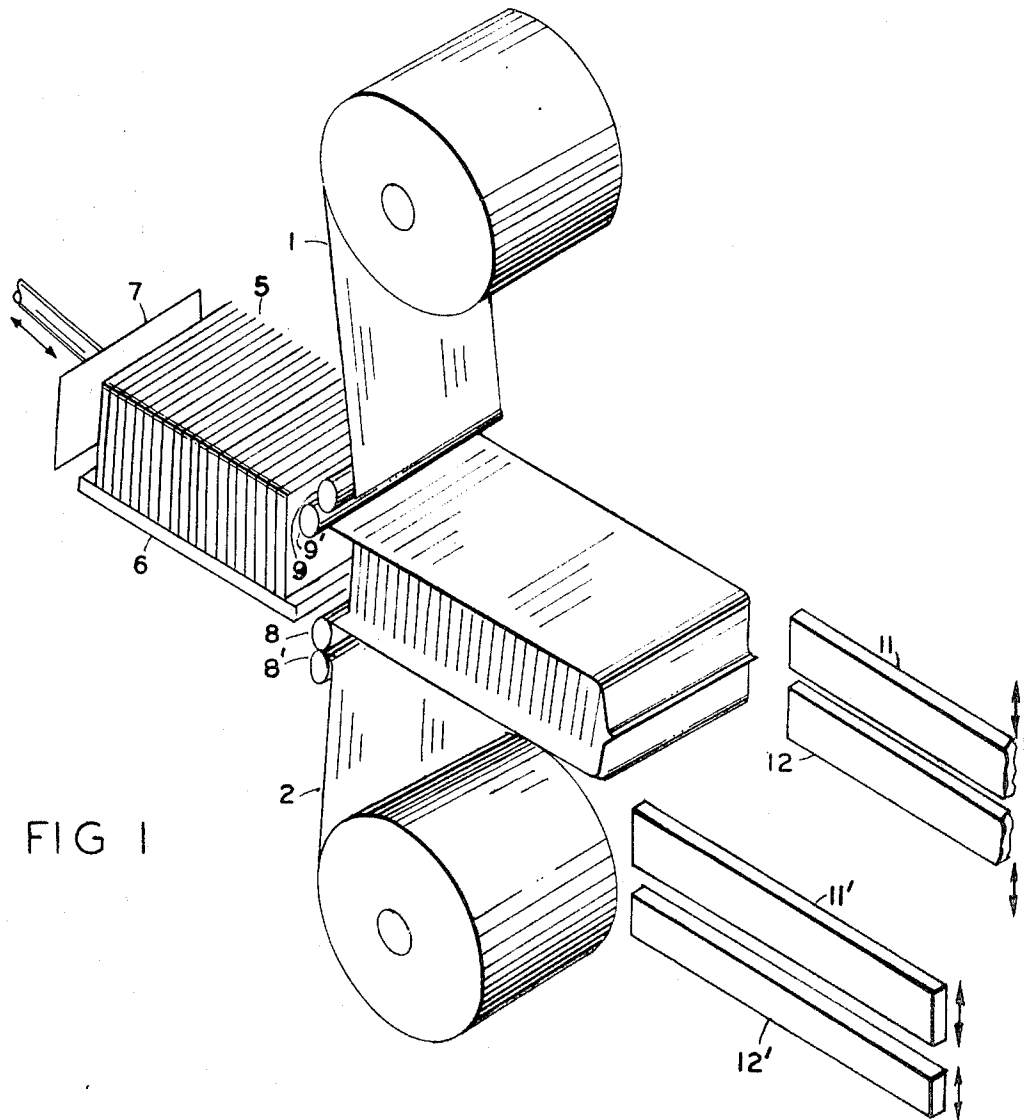


FIG 1

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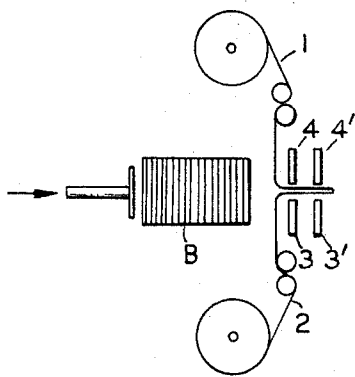


FIG 2A

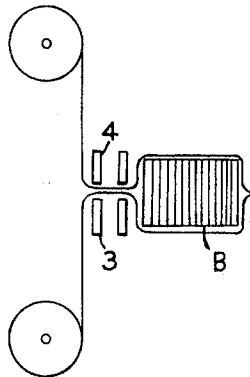


FIG 2B

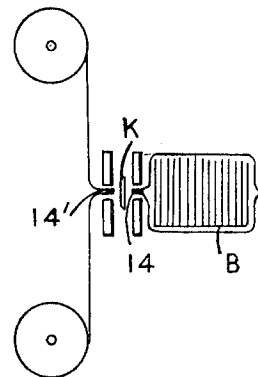


FIG 2C

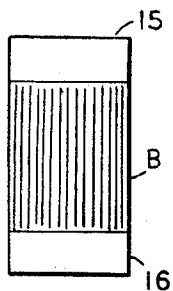


FIG 3A

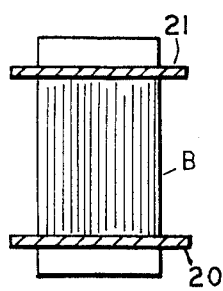


FIG 3B

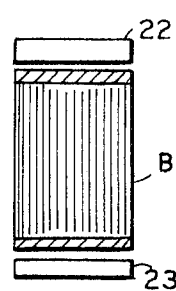


FIG 3C

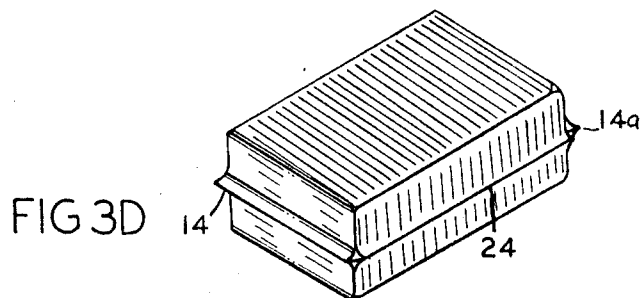


FIG 3D

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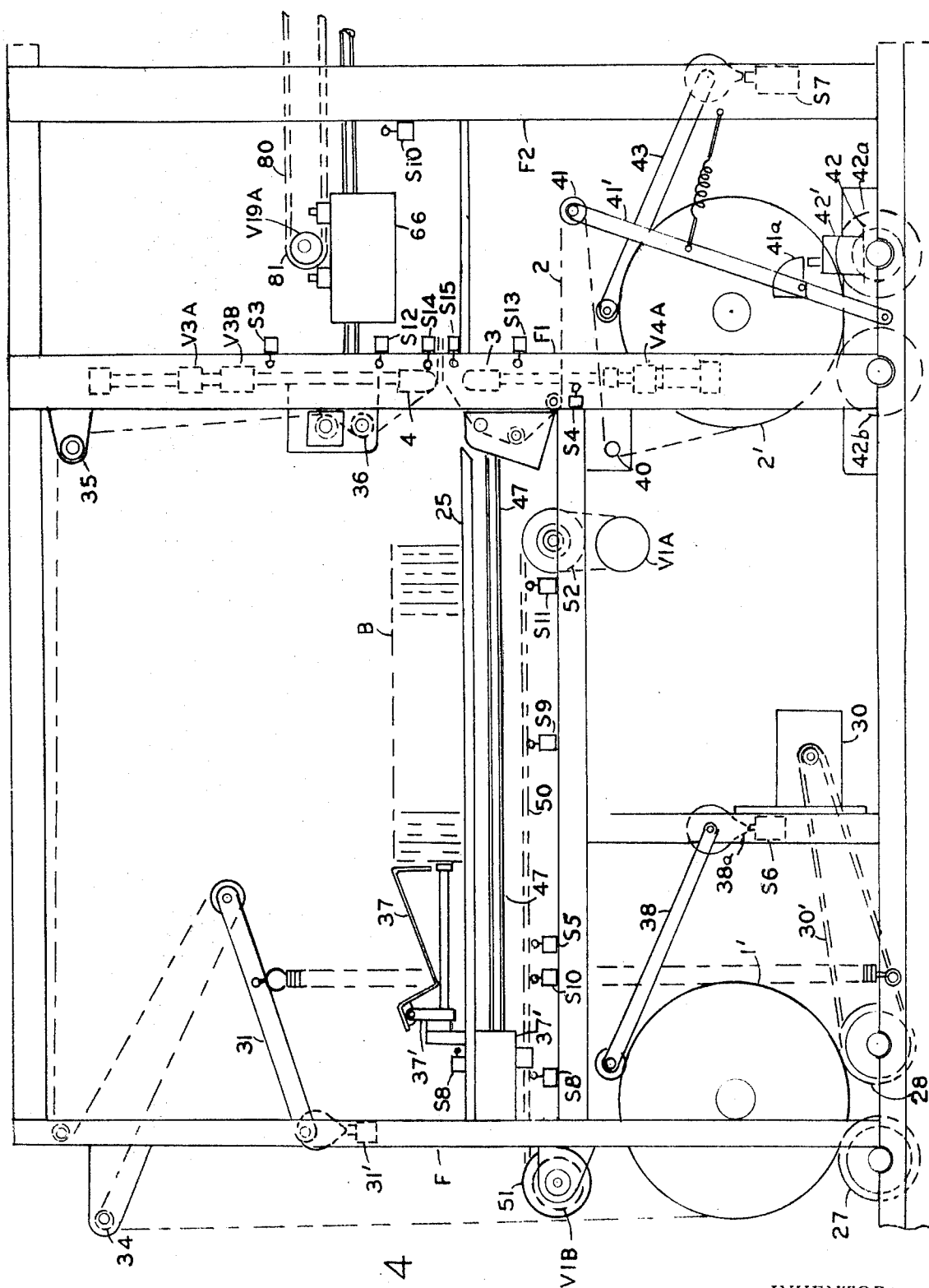
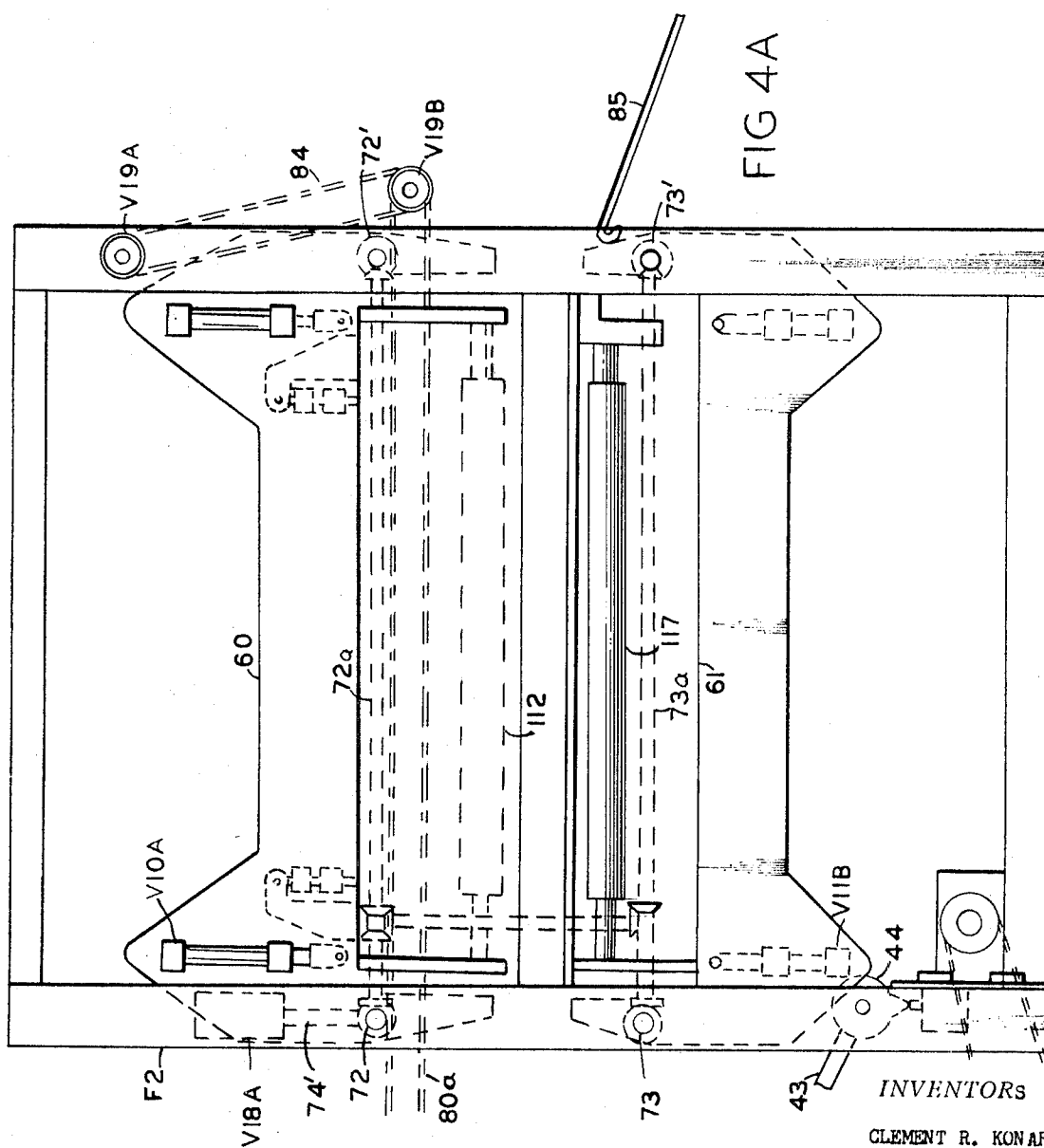


FIG 4

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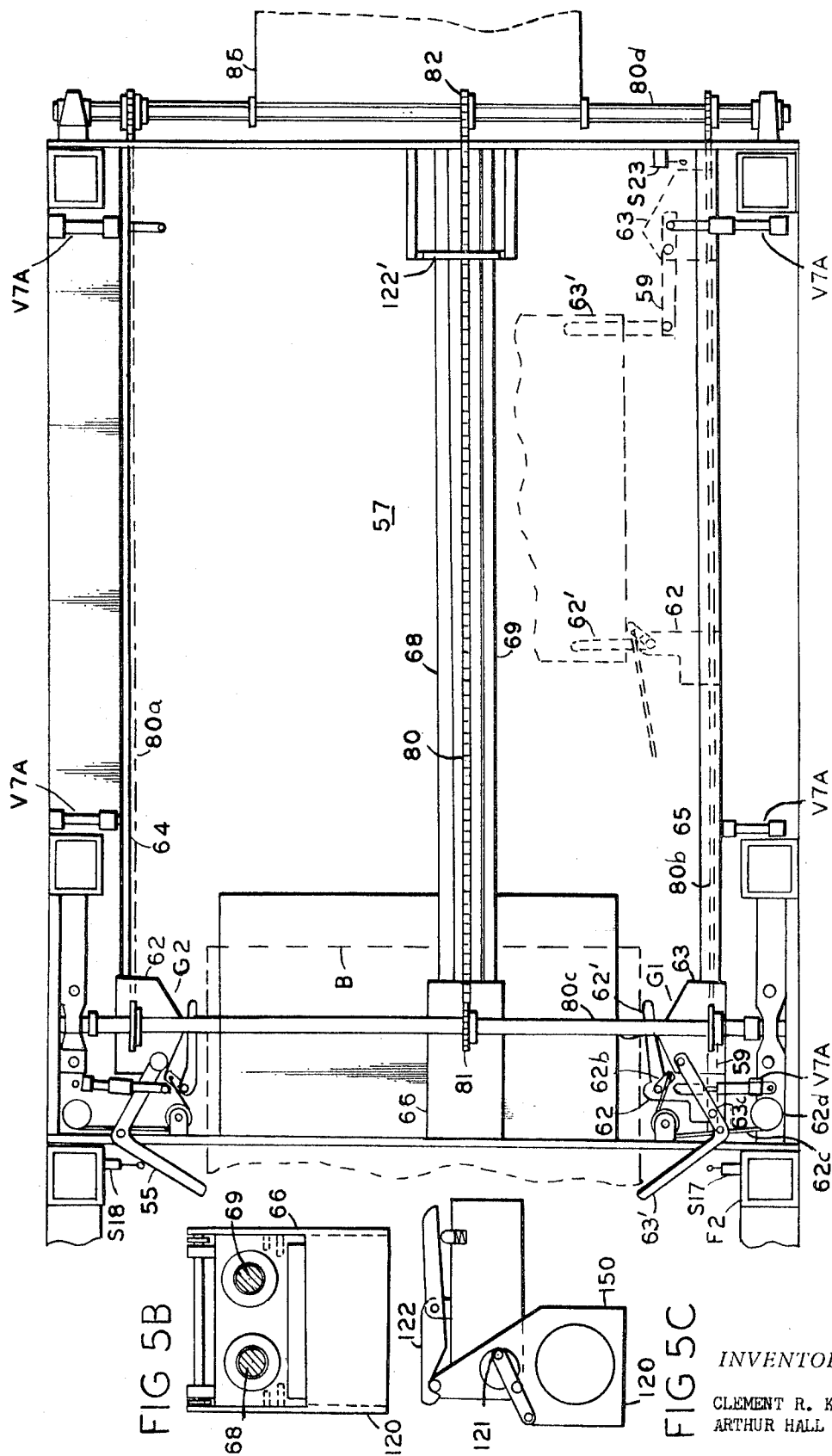


FIG 5

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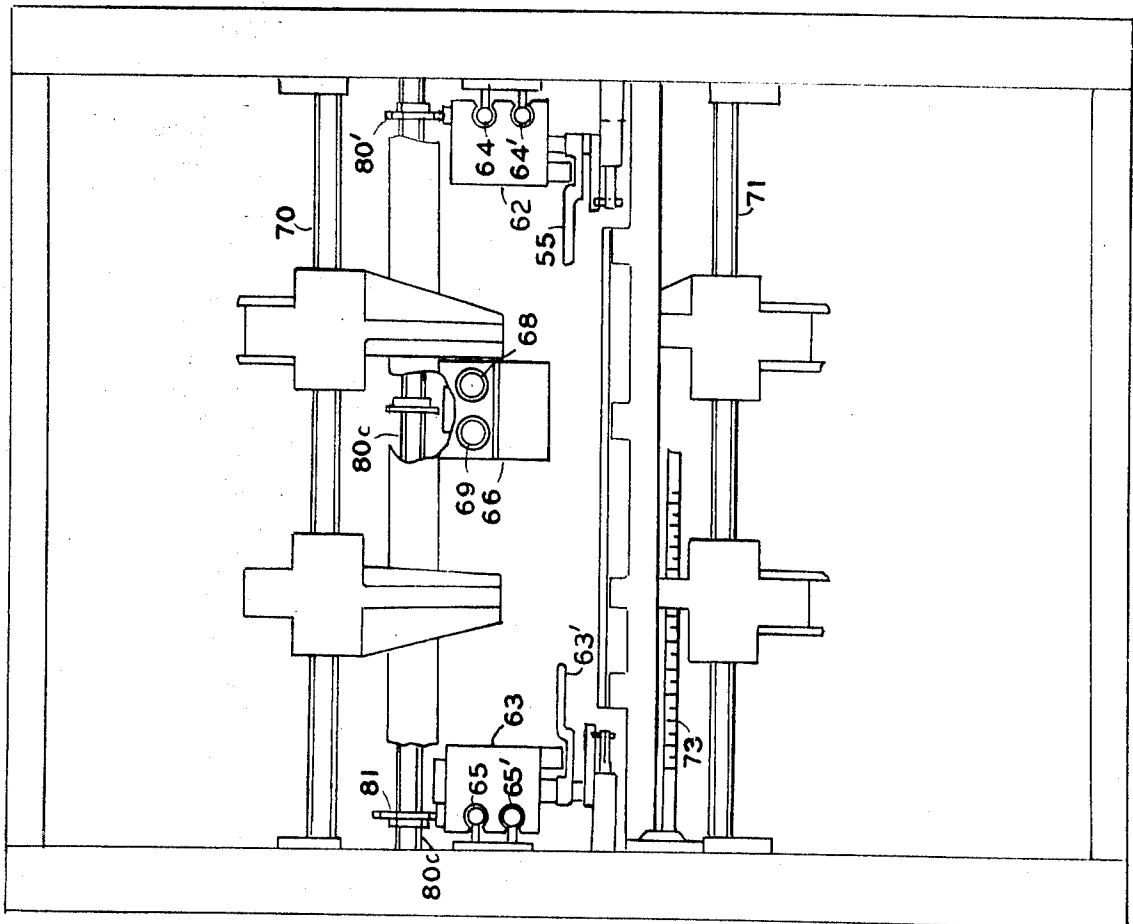


FIG 5A

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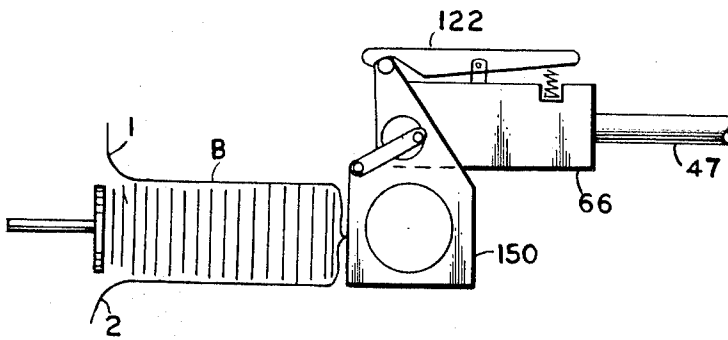


FIG 5D

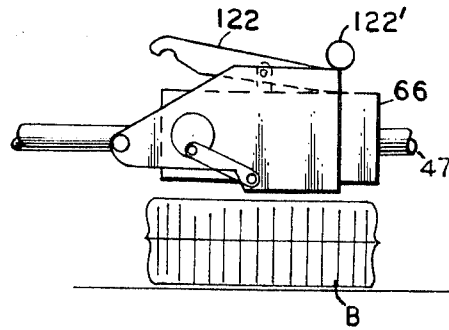


FIG 5E

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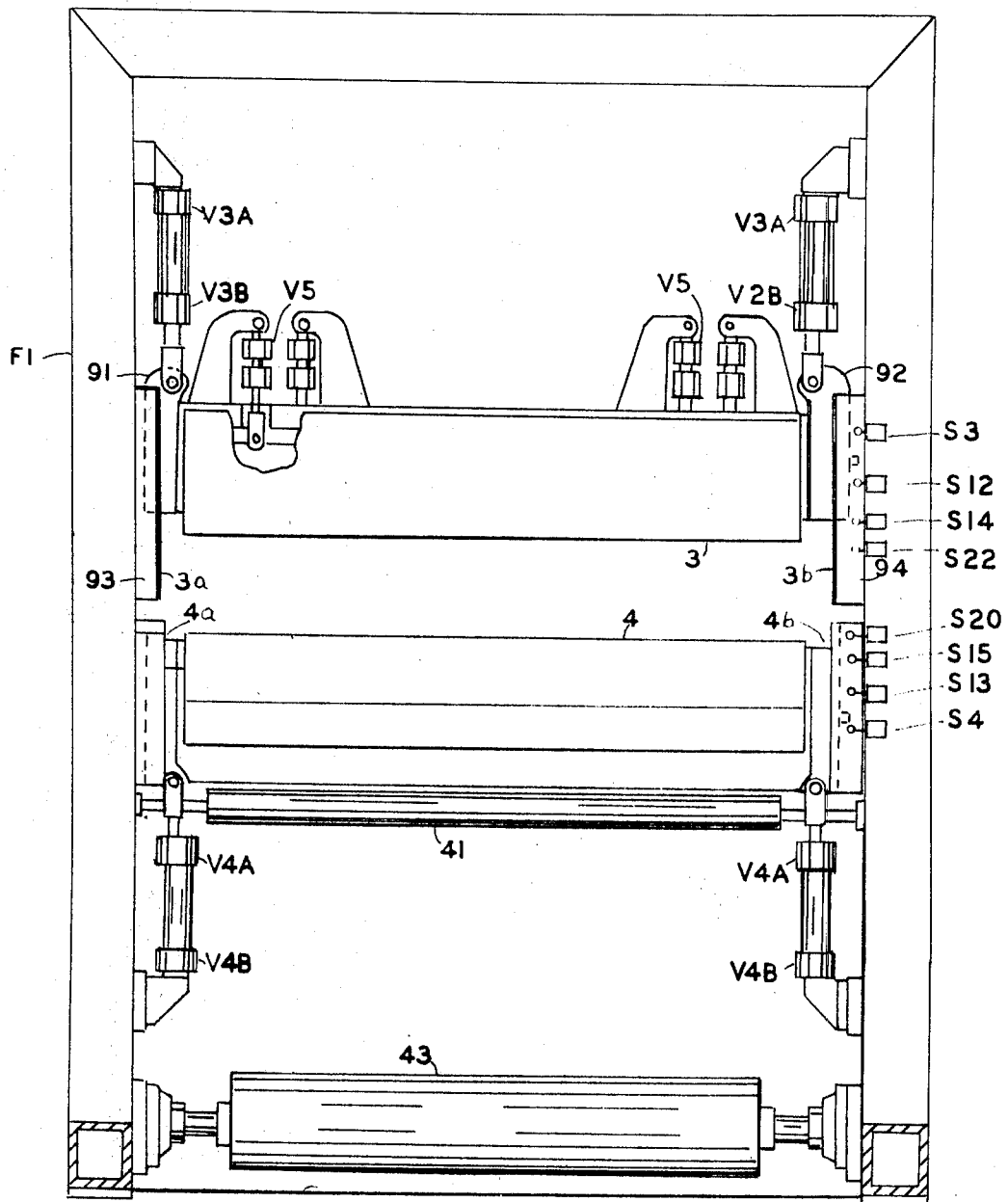


FIG 6

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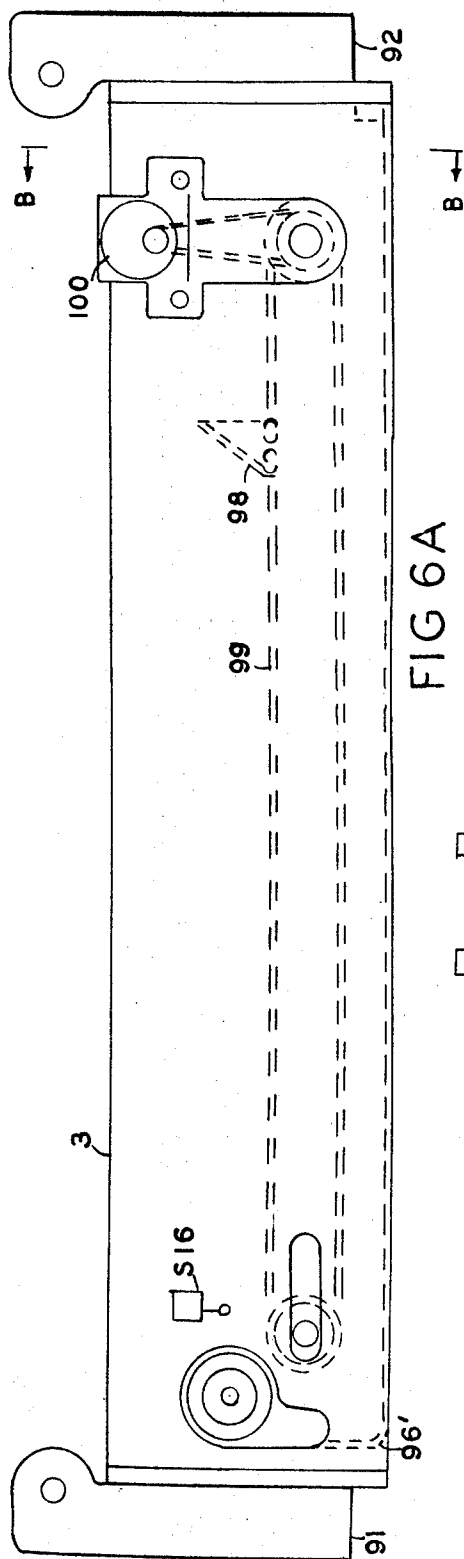


FIG 6A

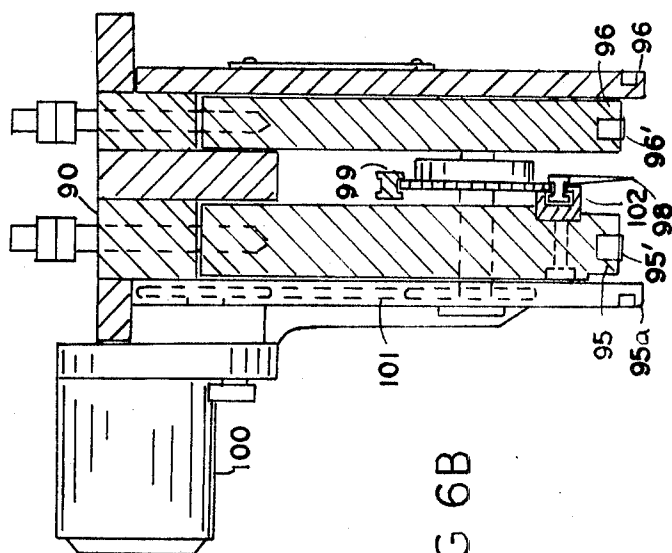


FIG 6B

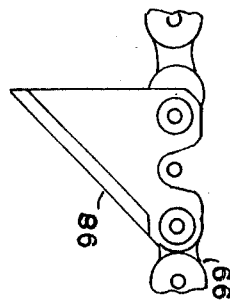


FIG 6C

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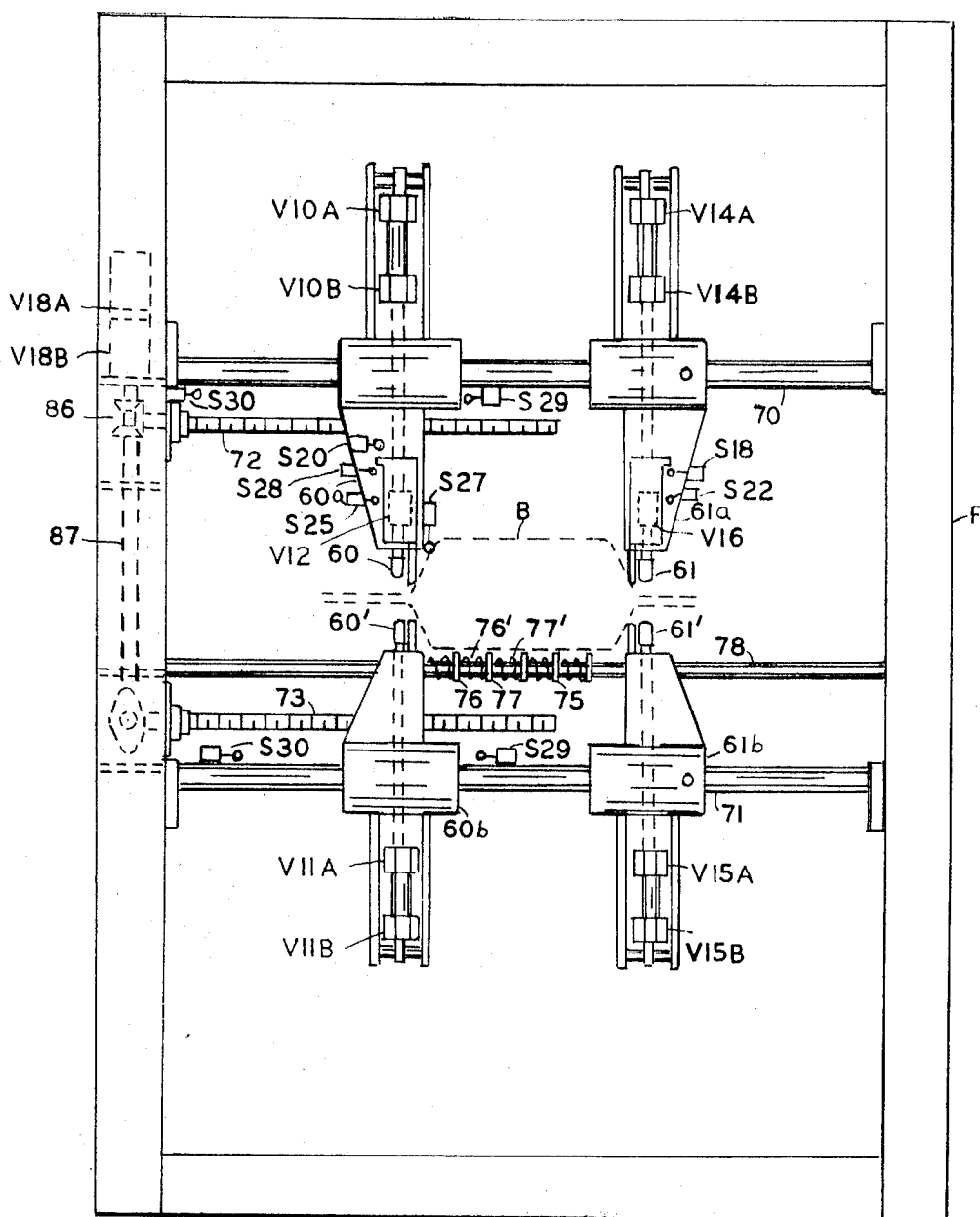
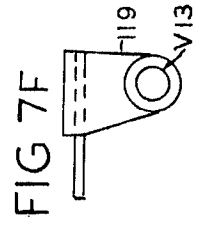
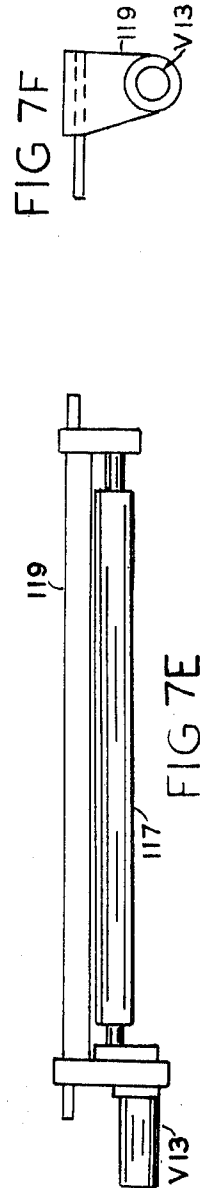
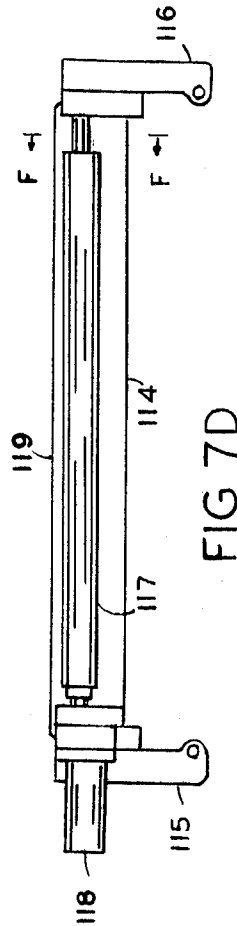
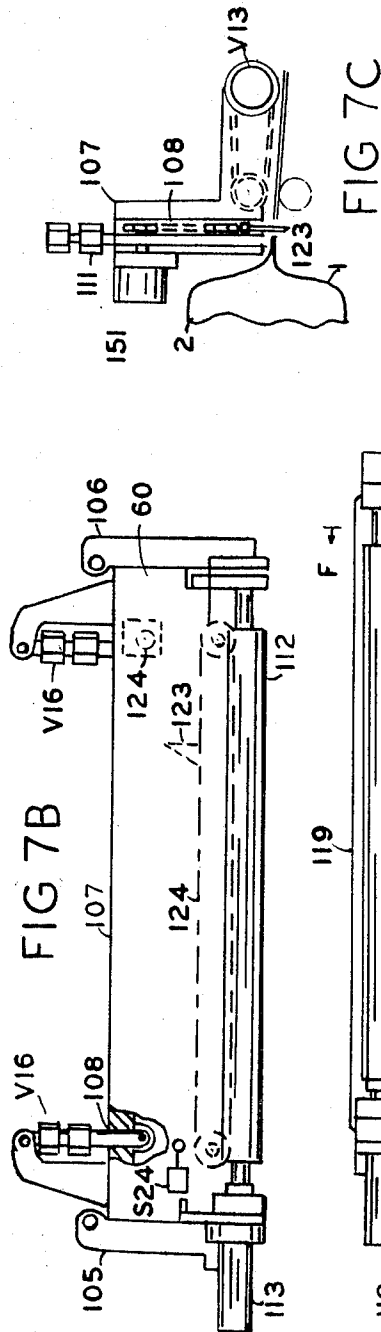
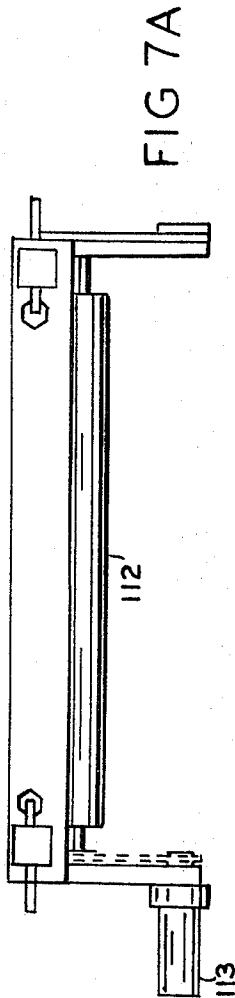


FIG 7

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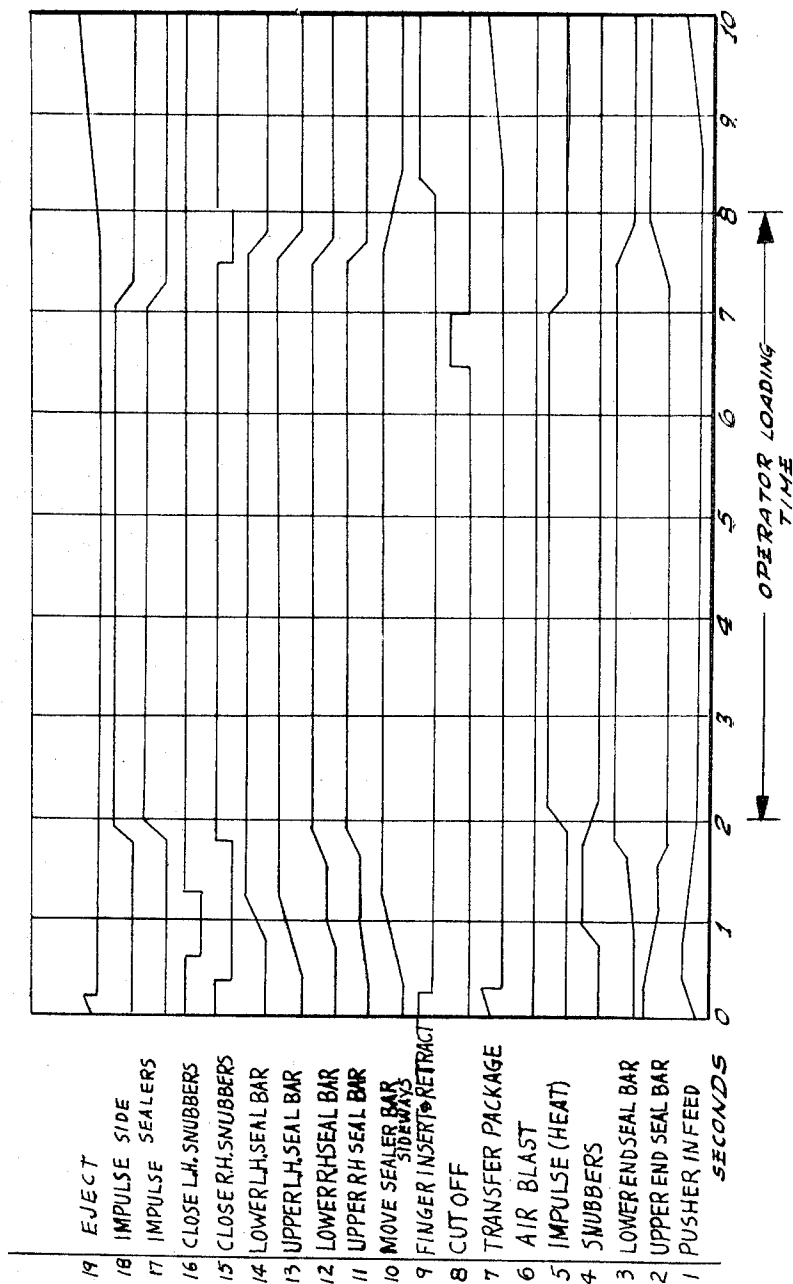
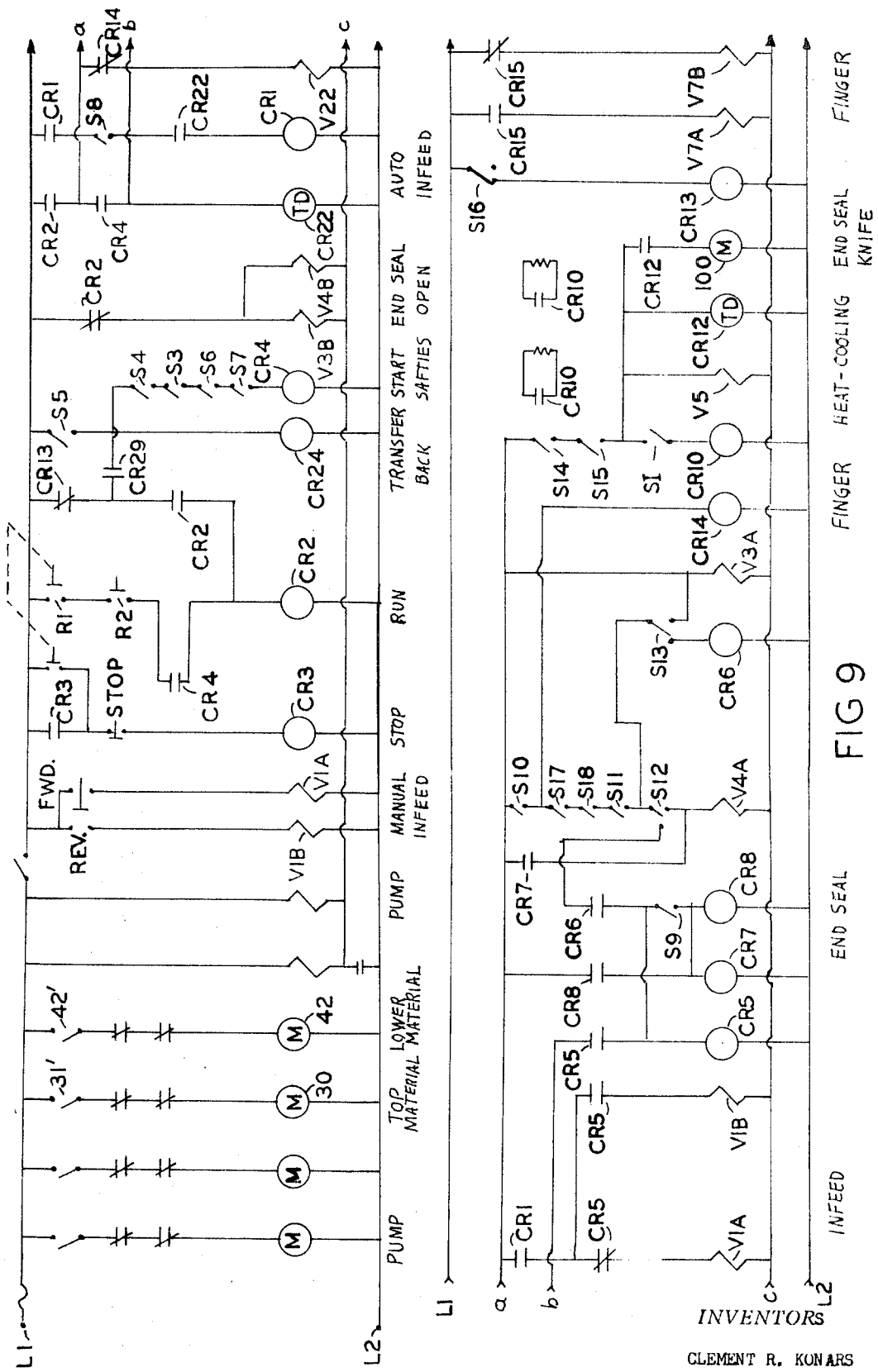
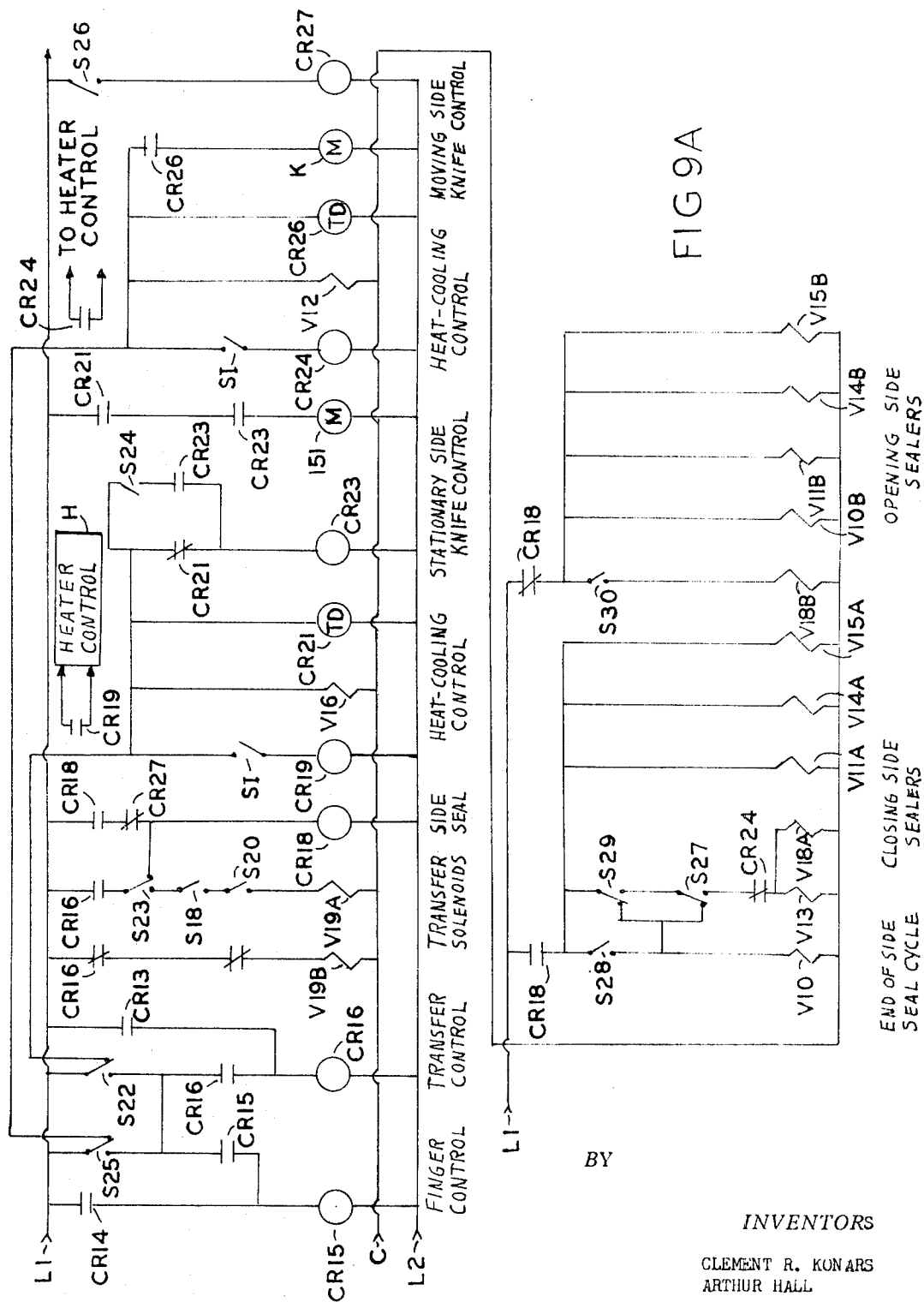


FIG 8

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DOUBLE WEB PACKAGING MACHINE

This application is an improvement of U.S. Pat. no. 3,377,772, granted Apr. 16, 1968 for AUTOMATIC WRAPPING MEANS.

That patent shows a machine for wrapping bundles with a single web of wrapping material. When inserting the bundle against the single web, it has been found that it is difficult to maintain the articles such as envelopes in good alignment, since they have to be pushed relative to and against the single web which is clamped at one end. This develops reaction forces which tend to break up the bundle.

The present invention solves this problem by providing first and second webs of plastic material. One web is fed from above and one from below and the ends are sealed at a first location. The bundle is then pushed against the sealed end sufficiently to move the bundle past the first sealing location. The webs are then snubbed down together in the rear of the bundle and the rear of the bundle is sealed. The free ends of the webs are also sealed at the same time and the bundle is cut off from the webs. With this mode of operation, there is no motion of articles relating to the webs such as would cause friction drag forces tending to cause the articles to be forced out of position in the bundles.

Accordingly, a principal object of the invention is to provide new and improved wrapping means for variable size and width bundles.

Another object of the invention is to provide new and improved wrapping means for variable size and width bundles of discrete articles such as envelopes and letter mail.

Another object of the invention is to provide a new and improved double web wrapping machine, for wrapping bundles of variable length and width having end-sealing means at a first location, side-sealing means at a second location and having automatic means to move the bundle between the two locations and wherein one of the side-sealing means is moved to accommodate variable width bundles and wherein means are provided to remove excess wrapper material.

Another object of the invention is to provide new and improved means for wrapping bundles of variable length and width, comprising means to feed a first web of heat-sealable wrapping material to a first work location, means to feed a second web of heat-sealable wrapping material to said first work location, a bundle-receiving platform, means to hold said webs together in a first plane at said first work location and seal said webs together, means to push said bundle on said platform along an axis perpendicular to said plane against said sealed webs and completely past said first plane to form a loop of said web-wrapping material around said bundle, means to heat seal the end of said web loop, means to cut said loop from said webs and reseal the ends of said webs in said first plane, first stationary side heat-sealing means at said second work location, second side-sealing means at said second work location, said second side-sealing means being adapted to move perpendicular to said axis to permit snug side-sealing of bundles of variable width.

These and other objects will be apparent from the following specification and drawings of which:

FIG. 1 is a perspective diagram of an embodiment of the invention.

FIGS. 2A, 2B, 2C, 3A, 3B, 3C and 3D are diagrams illustrating the operation of the invention.

FIGS. 5D and 5E are diagrams illustrating the operation of the hold back device.

FIGS. 4 and 4A show a side view of an embodiment of the invention.

FIG. 5 is a partial top view of the embodiment.

FIG. 5A is an elevation detail view of the finger transport.

FIGS. 5B and 5C are detail views of the holdback means.

FIG. 6 is an elevation view of the end-sealing means.

FIGS. 6A, 6B and 6C are elevation detail views of the end-sealing means.

FIG. 7 is an elevation view of side-sealing means.

FIGS. 7A, 7B and 7C are detail views of the upper side-sealing means.

FIGS. 7D, 7E and 7F are detail views of the lower side-sealing means.

FIG. 8 is a timing diagram.

FIGS. 9 and 9A are schematic diagram of electrical control circuits.

FIG. 1 shows a perspective view illustrating the operation of the invention. A first web 1 of heat-sealing plastic material is fed down to a first work location between the rollers 9 and 9'. A second web 2 is fed from below, up between rollers 8 and 8' to the same work location. The bundle 5 to be wrapped, for instance a stack of envelopes or mail, is mounted on a platform 6.

To begin the operation, the webs 1 and 2 are sealed together by the heaters 3 and 4, FIG. 2A, to form an end seal for the bundle. The heaters 3 and 4 are then separated and the bundle is then pushed either manually or by hydraulic type device 7 through the work location plane defined by the heaters and between the snub rollers 8 and 9 so that as the bundle is pushed forwardly, the two joined webs form a loop around the bundle. After the rear edge of the bundle clears the work location of the heaters 3 and 4, then these heaters are brought down against and seal the trailing end of the bundle. There are two separated seals made by two separate seal bars. Severing is then done by a knife or hot wire in the heating arrangement, as will be explained.

In the embodiment of FIG. 1, the side sealer means is movably mounted so as to come into the side of the bundle to seal the side edges. The side-sealing means has heaters 11 and 12 that squeeze the side portions of the webs together and seal them along the side of the bundle.

There is a corresponding side-sealing means 11' and 12' on the other side. The second side-sealing means may be stationary. The purpose of having one side sealer movable is to accommodate bundles of variable width.

The embodiment of FIG. 1 is a simplified version. In another embodiment of the invention, the second work location, i.e. the side seal work location, is spaced further downstream so that while the side sealing is taking place, another bundle may be end sealed simultaneously. This provides the shortest overall time cycle.

FIGS. 2A, 2B 2C all show diagrams illustrating the steps of the invention. In FIG. 2A the bundle B is shown in its platform position and the heat sealers 3, 3' and 4, 4' have just sealed the ends of the webs 1 and 2 together. In FIG. 2B the bundle has been pushed past the first work location defined by the heaters and these heaters are again closed to form the end seal.

In FIG. 2C, the end seal 14 has been formed and the webs have been resealed at 14' by operation of the heaters and immediately after the sealing, the bundle has been severed from the web. This means may be a traveling knife K or a hot wire on the sealers.

Referring to FIGS. 3A, 3B, 3C these diagrams illustrate the side-sealing operation which follows the end sealing operations. In FIG. 3A the bundle B has been end sealed as in FIG. 2C and the side portions 15 and 16 of the webs form loops. In FIG. 3B the side-sealing means 20 and 21 come down and have sealed the sides of the bundle B. In FIG. 3C the waste portions 22 and 23 of the web have been severed. This is preferably done by means of a traveling knife or blade after the sides have been sealed.

FIG. 3D then shows the sealed bundle B having end seals 14, 14a and side seal 24. There is a corresponding side seal on the other side of the bundle which is not shown.

GENERAL OPERATION

Referring to Time Cycle Chart, FIG. 8:

The operator places a tray of bundles of mail in the loading section of the machine. The bundle of mail tray is then turned up-side-down, placing the bundle of mail on the loading table. A pusher that is used to push the bundle of mail through the seal bars is then energized to move the bundle of mail forward up to the web. The operator holds the bundle of mail in place.

After the mail bundle is captured between the web and pusher, the operator pushes a start button that will start the machine cycle as per time cycle. The mail is then pushed through the seal bars into the web which then covers the front, top, and bottom sides of the mail bundle.

When the mail bundle pushed through the seal bars to form the first wrap of the package, two fingers are inserted into the package called the leading and trailing fingers, (FIG. 5). These fingers fit any size package as the package is made. The fingers will automatically adjust themselves to fit the package. These fingers serve two purposes. They hold the material tight for side sealing of the package and they transfer the package in the machine from the first end seal section to the second side seal station.

The first section is also equipped with a device known as the holdback 66. This unit is also tied to the finger drive and travels along with it. The holdback is hydraulically operated. This unit backs up the mail and web as it is pushed through the end seal bars so the mail is then held between the pusher, web and holdback with the fingers inserted in the sides of the package.

The machine is now ready to make the first seal. The upper and lower seal bars close partially (refer to item 02 and item 03 of chart, FIG. 8). The purpose of the bar only closing partially is so the pusher can be retracted. After the pusher is retracted, the snub rolls are energized, which will torque the web to a preset tension about the mail (refer to FIG. 4) after the snub rolls have torqued the material. The seal bars now close all the way capturing the material between clamps. After the material is clamped (refer to item 05 of chart, FIG. 8) it is energized making the seal (item 05), and is retracted. Preferably a constant flow of air is blowing across the seal area. After the seal, there is a traveling knife that will cut the package free from the web (item 08 cutoff on chart, FIG. 8). The seal bars will now open. The first operation on the package is completed.

While this first cycle was taking place, the operator had time to reload the machine to start a new cycle as indicated on chart (FIG. 8). As this cycle is repeated, the first package is being transferred to the second section side seal station (item 09, see chart). The holdback and fingers are returned to the first station. Upper and lower seal bar on the right-hand side close, snub, and seal the package (refer to item 011, 012, 015, 017 on chart), trim off the excess material and discharge into a hopper. At the same time, (refer to item 010 of chart) the left side sealer must move sideways to accept the various width packages. This side seal bar will sense the width of package and then close, snub, seal and cut off and discharge the scrap. After this operation the package is complete and the first operation on another package is complete. In the first section of the machine, the machine should be loaded for another cycle making one package every 10 seconds (as per chart). When another cycle is started, the completed package is ejected on a discharge chute (refer to item 021 on chart, FIG. 8).

DETAILED DESCRIPTION

Specifically referring to FIG. 4, it shows a side view of the input station and the end-sealing station. The bundle B is placed on the platform 25 which is mounted on the frame member F1, and the corresponding member on the other side. The bundle of mail is transferred by means of the hydraulic motor V1A. The pusher 37 is collapsible and pivots from carriage 37'. This pusher is collapsible so as to permit the upper seal bar 4 to close down behind the bundle of mail to prevent any spillover.

The web 1 is provided from the reel 1' which is mounted on supporting rollers 27 and 28 which are rotatably mounted on the frame and are driven by the motor 30 by means of a chain 30'. The web 1 is fed over idler roller and over tension control arm 31, idler roller 34 and 35 and snub roller 36 which is mounted on the reciprocating heater 4 assembly.

The tension arm 31 operates a switch 31' which controls the motor 30 so that as the bundle B is pushed by the pusher 37 and causes a strain on the web 1, then the tension arm 31 will move counterclockwise and actuate switch 31' to turn on the drive motor 30 to turn the reel 1' so that there is substantially no loading on the web.

The arm 38 rides with material roll 1' and when material roll 1' is reduced in diameter, size arm 38 will lower, energizing a microswitch S6, and shut the machine off, indicating an empty roll.

The web 2 is fed over guide roller 40 and around the roller 41 on tension arm 41' which controls switch 42' by means of cam 41a. This switch is connected to control motor 42 which controls the rollers 42a and 42b which operate the rollers 2', in the same manner as previously discussed.

The arm 43 rides with material roll 2' and when material roll 2' is reduced in diameter size arm 43 will lower, energizing a microswitch S7 and shut the machine off, indicating an empty roll.

The pusher 37 on mounting 37' is arranged for horizontal movement along the horizontal rod 47 by means of the chain drive 50 which is mounted on the sprockets 51, 52. The chain is driven by hydraulic forward and reverse motors V1A and V1B. This operation is described in connection with the circuit of FIGS. 9 and 9A.

To start the operation, the leading edges of the webs 1 and 2 are sealed together by the heating bars 3 and 4 are retracted.

In operation, the bundle of mail B is manually placed on the platform 25 and the mechanism is started by a manual push-button switch R1 which actuates the chain drive motor V1A to push the bundle against the web 1 and 2.

As the bundle is pushed in past the frame member F1 the two webs will be fed from the rolls 1' and 2' as previously described until the complete bundle is pushed past the frame F1.

In order to provide a snug bundle of mail, the bundle of mail is held back against the pusher 37 by means of the arm 120 of the holdback mechanism 66 (see also FIG. 5). This mechanism is a travelling block. The holdback block 66 rides on rods 68 and 69 and is moved by a chain 80, which is mounted on sprockets 81 and 82. The function of the holdback is to form a tight package for the end-sealing operation. Thereafter, the holdback mechanism travels with the side-moving fingers which move the package to the side-sealing position.

The heating bars 3 and 4 (FIG. 4) then come together and seal the webs around the bundle of mail. The heater bars 3 and 4 are then retracted and the web is cut by a traveling knife or hot wire between two seals (shown in FIG. 6B). This will free the bundle while still leaving the leading edges of the webs 1 and 2 together. The sequence and control of these operations is described more fully in connection with FIGS. 8 and 9.

FIG. 4A shows a side view of the machine extending to the right from the frame member F2 of FIG. 4 and showing the side-sealing station. The side-sealing bars 60 and 61 are also shown in FIGS. 7 and 7A-7F. The side-sealing bars are driven by hydraulic motors V10A, 10B, 11A, 11B, etc. These seal bars 60, 60' on one side are adapted to move sideways, as illustrated in FIG. 7, in order to accommodate different width bundles. The side movement is accomplished by the driven lead screws 72, 72', 73 and 73' (FIG. 4A). The lead screws 72, 73 are driven by hydraulic motor V18A, transfer shaft 74' and associated gears (FIG. 4A). The lead screws 72', 73' on the other said are connected to this drive by connecting shafts 72 and 73a, and associated gearing.

Snubbing rollers 112 and 117 (FIG. 4A) are actuated before the sealers contact to make the bundle (refer to FIGS. 7A-7F also). Chain 80a is mounted on sprockets 81 and 82 and is driven by a hydraulic motor V19B by means of chain 84. Chain 80a pulls the finger assembly block 63 (FIG. 5).

After the side sealing has been accomplished, as described in connection with FIGS. 7, 7A-7F, there may be excess material on the movable sealer side. This excess material is

removed by a traveling knife 123 (Figs. 7B and 7C). This knife is mounted on a chain 124. After the side sealing takes place, the sealing bars are retracted for the next operation and the next bundle of mail that is moved into the side sealer location will push the finished bundle off by means of the holdback 120 (FIG. 5) into the discharge chute 85 (FIG. 4A).

Referring to FIG. 5, it shows a plan view of the side-sealing station which is to the right of the frame F2, taken below the side-sealing bars, which are not shown in this Figure. After the bundle has been sealed at its end, the leading end of the bundle B extends forward of the finger assemblies G1, G2 on the sides of the apparatus. The purpose of these finger assemblies is to move the bundle to the right in FIG. 5 onto the table 57 into the side-sealing area of the side-sealing bars 60 and 61 (FIG. 4A) and to stretch the side web loops taut.

There is a package moving finger assembly on each side of the apparatus and these fingers are moved by means of the chains 80a and 80b. Each assembly comprises a leading finger 63' pivoted on block 63, and a trailing finger 62' pivoted on block 62. The leading finger 63' is actuated by cam track 59 which is actuated by hydraulic cylinders V7A. Finger 63' engages the leading edge of the loop formed by the open-sided webs. Trailing finger 62' is mounted on moving block 62 and has an overcenter linkage including arm 62b and cable 62c which is held by negator spring 62d. The trailing finger is actuated by one of the cylinders V7A. Finger 62' engages the trailing edge of the loop formed by the open-sided webs. The trailing finger is spring loaded so that the two fingers draw the open-sided loops of the webs taut so that good sealing is accomplished in the side-sealing station. If the webs were not held taut, then they would form a great number of wrinkles when sealed, which would result in a poor seal. The fingers remain in the loops just prior to the seal being made. The webs are held by a seal bar and snub roll in a taut condition and traveling knife in the middle. After the material has been cut, the excess material is discharged by means of energizing the snub roller 117 (FIG. 7E, 7D).

The leading fingers are actuated by a cam track 59 which extends along the length of each side. A cam follower 63c attached to the leading finger rides in the cam track 59. The cam track is mounted to be moved in and out by the hydraulic cylinders V7A. There is a corresponding cam track and finger assembly on the other side.

The finger transport operates as follows: The fingers 62' and 63' are pivoted and are mounted on blocks 62 and 63 which are adapted to travel on horizontal rods 64 and 65. The finger assemblies 62, 63 are driven by means of chains 80a and 80b (FIG. 5), mounted on shafts 80c and 80d, which are driven by hydraulic motor 83.

When the bundle B first reaches the position shown by the dotted lines at the left of FIG. 5, it has been sealed at each end but the sides are open. The finger assemblies are then actuated by cam tracks 59 and motors V7A so that the fingers rotate into the loop in each side of the bundle formed by the unsealed webs.

The finger transport assembly is then actuated to pull the bundle up to the area of the side-sealing bars 61 and 62 where the side sealing takes place, as will be described. The fingers hold the web loop taut when the sealing is being done to promote a smooth seal.

After the side sealing has been completed, the package is ejected to the right in FIG. 5.

FIG. 5A shows a sectional view illustrating the mounting of the finger transport. The lead fingers 55, 63' are pivoted in blocks 62 and 63, which are adapted to ride along the rails 64, 64', 65, 65' mounted on the side frames. The blocks 62, 63 are adapted to be moved by means of chains 80a and 80b (FIG. 5) which are mounted on the sprockets on shafts 80c and 80d. (FIG. 5).

Limit switches are provided to stop the finger transport at the proper location and to retract the fingers from engagement with the bundle and to return the finger transport assemblies back to their starting position, as discussed in connection with FIG. 9.

FIGS. 5B and 5C are side and front views of the holdback block assembly 66 which rides on the rods 68 and 69 and which is actuated by the chain 80. The block member 66 has a pair of shaftways which ride on the rods 68 and 69. A holdback lever member 120 pivots on the pin 121, where it is locked by means of the latch 122. The arm 120 is shown in down position in the FIG. 5C and 5D illustrating how it blocks the bundle B. After the seal has been completed, the arm 120 rotates counterclockwise in FIG. 5E after the latch 122 has been released by member 122', in order to permit holdback 120 to pass over the completed package. The previous package is pushed or ejected into chute 85 by the lead edge 150 of the holdback.

FIG. 6 shows an elevation view of the end-sealing station. Sealing bars 3 and 4 are mounted for reciprocation up and down in the gibs 3a, 3b, 4b by means of the hydraulic cylinder V3A, V4A which are mounted on the frame F1.

At the proper time, as will be described in connection with the electrical control, FIG. 9, the hydraulic cylinders are actuated to cause the heaters 3 and 4 to be retracted to open position and the bundle is moved to the side-sealing position. FIG. 6 also shows roller 43 which is one of the support rollers for the web roll 2'.

FIGS. 6A, 6B and 6C show details of the upper end sealer incorporating the cutting knife. The upper sealer assembly 3 comprises a support beam 90 which is connected to slide members 91 and 92, which are adapted to slide in gibs 3a and 3b (FIG. 6) which are mounted on the frame. A pair of seal bars 95 and 96 are slidably connected to the beam 90 and driven by cylinder V5. These bars mount heat sealing elements 95' and 96' which are mounted on suitable insulating blocks. Clamping members 95a and 96a extend beyond the sealing elements for positive clamping.

Between the sealing bars 95 and 96 is mounted a traveling knife 98, which is mounted on a chain 99. The chain is mounted on sprockets and are driven by the motor 100 through the chain 101. The traveling knife 98, as illustrated in FIG. 6C, is preferably triangular in shape and is connected to the chain 99. The knife is guided during the cutting operation by means of the guide 102. The lower sealer assembly is similar except that it does not have the knife and has spring loaded clamp members.

Therefore, after the upper and lower seal assemblies have made two seals by means of the heaters 95' and 96', the traveling knife is actuated to cut the webs free from the package.

FIG. 7 shows the end view of the side sealers. The side sealers 61 and 61' are mounted in stationary fashion on members 61a, 61b on the rods 70 and 71 which are mounted on the frame.

The side sealers 60 and 60' are mounted on members 60a and 60b which are movably mounted on the rods 70 and 71 and moved by means of the lead screws 72 and 73 which are connected together by gears 86 and shaft 87 and driven by motor V18A and by automatic control means, as will be described. The purpose of having the sealers 60 and 60' movable sideways is to accommodate different width bundles.

In the side-sealing position, the bundle B sits on the table 75 which is collapsible to accommodate movement of the side sealers 60 and 60'. The table 75 comprises a series of slats 76, 77, etc. which are mounted on rods 78 and which are normally apart by means of springs 76', 77', etc.

The side sealers are actuated by hydraulic cylinders V10A, V11A, V14A, V15A which are controlled in the proper sequence, as will be described.

In operation, after the bundle has been moved into the side-sealing location, then the movable side sealers 60, 60' are actuated by control means which drive the lead screws 72 and 73 to move the side sealers to the right in FIGS. 7 so as to squeeze the mail or bundle between the left and right side sealing members. This side drive has a sensing switch S27 controlling a hydraulic motor so that when it meets resistance, that is, when the mail or bundle is squeezed, then the motor will stop and the side sealers will then be cycled. The bundle is then complete except for any necessary trimming of excess material off one side of the bundle.

FIGS. 7A, 7B and 7C show top, front the side views of one of the upper side sealers. The sealer assembly is mounted on slides 105 and 106 which are adapted to slide in gibs mounted on the frame and are actuated by cylinders V10A, V11A, V14A, V15A (FIG. 7). The assembly comprises a beam member 107 connected to the slides. The heater bar 108 is movable and is mounted on the beam and adapted to be moved into sealing position by the hydraulic cylinders V16. A snubbing roller 112, which can rotate, is mounted on an extending bracket connected to the main support beam 107 and a snubbing roller is connected to be driven by hydraulic motor V13.

FIGS. 7D, 7E and 7F show front, top and side views of the lower heater assembly. This assembly is comprised of a beam member 114 which is connected to two slides 115 and 116 which are adapted to slide up and down in gibs. A snubbing roller 117 which can rotate is mounted on brackets extending from the support beam 114 and is connected to be driven by the hydraulic motor V13. The heater bar 119 in this assembly is rigidly connected to the beam 114 and is adapted to come in contact with the upper sealer when the lower sealer assembly is raised by hydraulic cylinder V11A, V15A. Just before the heaters come together, the snubbing rollers grip the webs between them and the snubbing rollers are driven to take up any slack in the webs to form a snug package.

As the snubbing rollers come in contact with the webs, the package-moving fingers are retracted. Both left and right-hand side sealers operate at substantially the same time. After the side seals are completed, the package is finished and ready to be ejected.

Traveling knife 123 is mounted on chain 124 which is driven by motor 151, to cut off excess material from webs 1 and 2.

FIG. 8 illustrates a timing diagram of the various operations of the machine. The lower line illustrates the 10-second timing cycle. Note that the operator has 6 seconds for loading the platform of the machine while operations are taking place on the preceding bundles. The complete cycle for a package is 16—30 seconds.

The lowest line 1 illustrates the time sequence of the pusher means showing that the bundles are fed into the first work location.

Lines 2 and 3 illustrate the closing of the upper and lower end sealing bars 3 and 4, which operation starts within the first second. Note that the sealing bars remain closed from about 1.8 seconds until the 7th second when they open. During about half the time they are closed, the heat is applied and the remaining half is a cooling time for the seal to cool.

Line 4 illustrates the movement of the snubbing rollers at the end seal.

Line 5 illustrates the heating pulse of end sealers.

Line 6 illustrates the continuous airblast.

Line 7 illustrates the movement of the finger transfer means which moves the package from the first work location to the second work location.

Line 8 illustrates the movement of the end seal cutting knife.

Line 9 illustrates the operation of the fingers for moving the bundles.

Line 10 illustrates the movement of the movable side sealer.

Line 11—14 illustrate the movements of the side sealing bars.

Lines 14 and 16 illustrate the movements of the side-snubbing rollers.

Lines 17 and 18 illustrate the times of the heating of the side sealers. Note that the side sealing is done on one bundle about the same time that the end sealing is being done on a second bundle so that the heating and cooling portions of the cycle are substantially simultaneous on both bundles. This is a condition for maximum speed of handling a number of bundles. If the end sealing and side sealing were done in one location then the overall cycle will have to be longer since the end seals must be formed first and allowed to cool to gain some strength before the side sealing can be done. Otherwise, the side seal-

ing would feature the end seal if it was not completed and cooled off so as to gain some strength.

Lines 19 and 20 illustrate the cooling airblast.

Line 21 illustrates the movement of the ejection mechanism which is generally coincident with the movement of the pusher on line 1, if a package is present, and the package transfer movement on line 7.

Electrical Operation of Packaging Machine

Referring to FIGS. 9, 9A and 4, normally open contacts are shown open and normally closed contacts are shown with a slant line through them. Switches marked SI are circuit isolation switches.

When the transfer 37 is back, switch S5 and the following switches are closed: lower end sealer down switch S4, upper end sealer up switch S3, material available switches S6, S7. Solenoid CR4 will energize, which will complete the circuit to CR4P.

Start of Cycle

When both run buttons R1, R2 are pushed and contacts of CR4 are closed, CR2 will energize and lock itself in through the normally open CR2 contacts and the normally closed CR13 contacts.

Automatic Infeed Control

When normally open contacts of CR2 and CR4 are closed, they will energize time delay relay CR22. After a slight delay, CR22 will energize CR1 which will lock itself in as well as CR22 through the rear limit of infeed switch S8.

With CR1 contacts closed, infeed forward automatic motor V1A and solenoid will energize. All motors are preferably pneumatic solenoid operated motors, with automatic return when the solenoid is deenergized. The infeed pusher will push the mail forward against the transfer holdback 66. When the transfer holdback 66 has moved 4 inches, switch S10 will close and energize CR14, which will energize CR15, normally open contact of CR15 will close and energize finger solenoid V7A which will energize cylinder to grab web material with fingers.

When the infeed has reached the end of its stroke, it will actuate the forward limit of infeed switch S11. If the two finger safety switches S17 and S18 have been closed, the end seal clamp bars V3A and V4A will start to close. When the mid-position switch S12 (FIG. 6) is actuated, the upper end clamp will stop its downward motion.

When the midposition switch S13 is actuated, the lower end clamp will stop its upward motion. CR6 will energize and energize CR5, which will lock in through its own contacts, the rear limit of infeed switch S8 and CR1 contacts. The automatic infeed back V1B will return the infeed 37 to its rear position. As the infeed is returning, it will actuate S9 which will energize CR7 and CR8. They will lock in through the contact of CR8. The contact of CR7 will close and again energize V4A and V4A, which will close the end clamp bars. When the infeed returns to its rear position, it will actuate the rear limit of infeed switch S8 and release CR5 and CR1 which will release all automatic controls of the infeed.

When the end clamp bars close, they will close switch S14 and switch S15 and energize CR10, which will fire the end seal heaters and energize motor V5 (FIG. 6), which will bring the heater bar down and energize time delay relay CR12, which will start the knife motor 100 after a predetermined time. As the knife completes its cycle, it will actuate momentary switch S16, which will energize CR13 for a moment.

End of End Clamp Cycle

The normally closed contacts of CR13 will open and release CR2, V3B and V4B will operate and open the end clamp bars.

Start of Transfer

The normally open contacts of CR13 will close momentarily and energize CR16 which will lock in through either clamp bars closed switches S22 and S25, CR16 contacts will close and energize the transfer motor V19A through forward position of transfer switch S23, upper stationary sealer up switch S18, and upper moving sealer up switch S20. When the transfer reaches the end of its travel, it actuates switch S23 which deenergizes the transfer motor V19A and energizes

CR18 which locks in through the normally closed contact of CR27 and the contacts of CR18.

Close of Side Seals

With CR18 contacts closed, the upper moving seal clamp motor V10A (FIG. 7) will come down, the lower moving seal clamp motor V11A will come up, the side snubbers motor V13 will rotate, the upper fixed side clamp V14A will come down, the lower fixed side clamp motor V15A will come up, the moving side motor V18A will close.

Cycles of Fixed Side Seal

When the fixed clamp bars close, they will actuate switch S22 which will energize CR19 which will fire the fixed side heaters H in heater bar 61. Switch S22 will also actuate V16 which will lower the fixed side seal bar 61; also time delay relay CR21 and relay CR23 will energize CR23 which will lock itself in through the fixed seal bar knife switch S24. After a preset delay CR21 will change position and start the knife motor 151 (FIG. 7C). After the knife has completed its cycle, it will actuate the fixed seal bar knife switch S24 (FIG. 7B) and release CR23 and the knife motor will stop.

Close of Moving Side seal

As the upper moving clamp V10A moves down, it actuates the mid position switch S28 which disconnects V10A and stops the downward motion. When the package size limit switch S27 or the moving side limits switch S29 is actuated, it disconnects the snubber V13 and moving side motor V18A which stops the closing motion. At the same time, the upper moving clamp V10A is energized by either of these switches.

Return of Transfer

When both side clamps are closed, switch S22 and S25 will be actuated and release CR15 and CR16. This will cause the fingers V7B and the transfer V19B to return to their rest position.

Cycle of Moving Side Seal

When the upper moving clamp V10A has closed, switch S25 will energize the moving side heat control relay CR24, the moving side seal bar V12 and the time delay relay CR26. After a predetermined time CR26 will energize the knife motor k. After the knife motor has completed its cycle, it will actuate the moving knife switch S26, mounted like S24 (FIG. 7B), which will energize CR27.

End of Cycle

When the normally closed contacts of CR27 open, they will release CR18 and the normally closed contacts of CR18 will energize the lower moving seal clamp down V11B, the upper moving seal clamp up V10B, the upper fixed clamp up V14B, the lower fixed seal clamp down V15B, and open the moving side V18B. The moving side V18B will open till it actuates switch S30 which will stop its motion.

We claim:

1. Means for wrapping bundles of discrete articles of variable length and width, comprising,
 - means to feed a first web of heat-sealable wrapping material to a first work location,
 - means to feed a second web of heat-sealable wrapping material to said first work location,
 - a bundle-receiving platform,
 - means to hold said webs together in a first plane at said first work location and means to seal the ends of said webs together,
 - means to hold back the leading end of said bundle,
 - means to push said bundle on said platform along an axis perpendicular to said plane against said sealed webs and said holdback means and completely past said first plane to form a loop of said web-wrapping material around said bundle,
 - means to slidably mount said holdback means to accommodate different length bundles, said holdback means being pushed together with said bundle, said holdback means being retractable to permit said bundle to pass it after said bundle has been sealed at its rear end,
 - means to operate said heat seal means to heat seal the ends of said web loop,
 - means to cut said loop from said webs and operate said end-sealing means to reseal the ends of said webs in said first plane,
 - first stationary side heat sealing means at said second work location,
 - second side-sealing means at said second work location, said second side-sealing means being adapted to move perpendicular to said axis to permit snug side sealing of bundles of variable width.
2. Apparatus as in claim 1 having a collapsible table at said second work location.
3. Apparatus as in claim 1 wherein said bundle comprises stack of envelopes mounted on one edge.
4. Apparatus as in claim 1 wherein said second work location is separated from said first work location by a predetermined distance and having means to move said end-sealed bundle loop comprising pair of fingers adapted to extend into said loop and means to move said fingers and said bundle to said second work location.
5. Apparatus as in claim 1 wherein said side-sealing means have snubbing means to wrap said web loop snugly against the sides of said bundle.
6. Apparatus as in claim 5 wherein at least one of said side-sealing means includes excess material trimming means.
7. Apparatus as in claim 1 having control means connected to operate said web-feeding means, said end-sealing means and said side-sealing means in a predetermined sequence.